Implementation Plan

Operations Manual to Reservoir Model

Implementation Step 1: Study the Operations Plan

A. Extract from the operations plan the normal operations
   - not emergency or special flood control rules

B. Write an outline of the rules of operation
   - Include dependencies of downstream control points
   - Include dependencies of other reservoirs

C. Map this outline against the RFS reservoir models

D. Determine the data you will need to model the reservoir

Implementation Step 1B Example: Normal Operations Outline

- Below 723.0 ft
  - Release to maintain elevation 723.0 ft for power generation
  - or meet low flow requirement of 250 cfs
- 723.0 – 754.0 ft Rising AND forecast not to exceed 754.0 ft
  - 723.0 < Elev < 724.8, Release <=12,000 cfs
  - 724.8 < Elev < 733.2, Release <=60,000 cfs
  - 733.2 , Elev < 754.0, Release <= 110,000 cfs
  - Downstream Tulsa gage < 110,000 cfs
  - Downstream Haskell gage < 130,600 cfs
  - Downstream VanBuren gage < 105,000 cfs

Implementation Step 1B Example: Normal Operations Outline

- 754.0 ft – 757.0 ft Rising OR forecast to exceed 754.0 ft
  - Begin raising gates to induce surcharge
- ELEV >757.0 ft RISING
  - Flows over top of fully open gates
- ELEV >757.0 ft FALLING
  - Evacuate induced surcharge with fully open gates
- 754.0 ft – 757.0 ft FALLING
  - Evacuate induced surcharge while closing gates
- 754.0 ft– 723.0 ft FALLING
  - Evacuate flood storage to 723.0 ft

Implementation Step 1C Example: Map Outline to RFS Models

- Below 723.0 ft
  - Release to maintain elevation 723.0 ft for power generation
  - or meet low flow requirement of 250 cfs
- RES-SNGL
  - Define daily power generation with POWERGEN with daily option
  - Define Low Flow Requirement with SETQ scheme with constant release of 250 cfs
  - Use POOL and QO keywords and SETMIN utility in RCL to select active scheme
- RES-J
  - Fake daily power generation with the SETRELEASE method with the diurnal variation option
  - Define the low flow requirement with the SETRELEASE method
  - Select the minimum release with the SETMIN method
  - Execute this SETMIN in the RULES section to activate method.

Implementation Step 1C Example: Map Outline to RFS Models

- 723.0 – 754.0 ft Rising AND forecast not to exceed 754.0 ft
  - 723.0 < Elev < 724.8, Release <=12,000 cfs
  - 724.8 < Elev < 733.2, Release <=60,000 cfs
  - 733.2 , Elev < 754.0, Release <= 110,000 cfs
  - Downstream Tulsa gage < 110,000 cfs
  - Downstream Haskell gage < 130,600 cfs
  - Downstream VanBuren gage < 105,000 cfs
- RES-SNGL
  - Use RISING keyword
  - Define SUMINF Utility and FLOOD Keyword to check if forecast is to exceed 754.0 ft
  - Define POOLQ scheme with constant discharge
  - Define downstream control points (2 Maximum) with STPOOLQ
  - Add local flow if not negligible
  - Use POOL and RISING keywords and SETMIN utility to select active scheme
- RES-J
  - Use PREVIOUSPOOL and POOL keywords to determine if rising pool.
  - Can not model forecast condition to exceed 754.0 ft
  - Define SETRELEASE method with constant discharge between elevations
  - Define downstream control points with MAXSTAGE method (only 2 allowed)
  - Add local flow if not negligible
  - Select minimum release with SETMIN method, execute this SETMIN method in the RULES section

Implementation Step 1C Example: Map Outline to RFS Models

- 754.0 ft – 757.0 ft Rising OR forecast to exceed 754.0 ft Begin raising gates to induce surcharge
- RES-SNGL
  - Define INDSRCHGE Scheme
  - Use FLOOD keyword to determine if elevation is forecast to exceed 754.0 ft
  - Use POOL and RISING keyword and SETMIN utility to select active scheme
- RES-J
  - Cannot model this condition

Implementation Step 1D Example: Determine the data you will need

- Reservoir operations manual with rules of operation
- Reservoir elevation-storage curve digitized
- Induced surcharge curve digitized
- Spillway rating curve – partial and full gate open digitized
- Historical data time series for ICP runs
  - Inflow time series
  - Outflow time series
  - Local inflow to downstream control points

Implementation Step 2: Collect Data Required

A. Collect Data Required - For Keystone example
   - Reservoir operations manual with rules of operation
   - Reservoir elevation-storage curve digitized
   - Induced surcharge curve digitized
   - Spillway rating curve – partial and full gate open digitized
   - Historical data time series for ICP runs
     - Inflow time series
     - Outflow time series
     - Local inflow to downstream control points

B. Format time series data into card time series

Implementation Step 3: Select Model

A. Review 1C (Map Outline of Operations to NWSRFS Models)
B. Determine if you can get the data you need operationally

Implementation Step 4: Code the parameters in MCP3

A. Define Schemes/Methods
B. Define RCL/RULES
C. Define input/output time series
D. Define displays
   - Plot inflow, simulated outflow, observed outflow
   - Plot pool elevation
   - Use PLOT-TS to view multiple data types concurrently

Implementation Step 5: Run implementation in MCP3

A. Determine when largest errors are occurring
B. Determine which operations should be governing this period
C. Determine if governing operations are coded correctly